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Semester - V

An Introduction to
Financial Economics

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An Introduction to Financial Economics

SEMESTER-V

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Syllabus : University of Calcutta

Discipline Specific Elective-B(1) :

ECO-A-DSE-5-B(1)-TH-TU

Financial Economics [FE]

Total Marks : 100 [Theory(TH) 65 + Tutorial(Tu) 15 + Internal Assessment 10 + Attendance : 10]

Total Credits : [5(TH) + 1(Tu)] = 6.

No. of Lecture hours : 75, No. of Tutorial contact hours : 15

[Semester-V]

ECO-A-DSE-5-B(1)-TH

1. **Investment Theory and Portfolio Analysis 35 lecture hours**
   - Deterministic cash flow streams : Basic theory of interest, discounting and present value ; internal rate of return ; evaluation criteria ; fixed-income securities, bond prices and yields ; interest rate sensitivity and duration ; immunisation ; the term structure of interest rates ; yield curves ; spot rates and forward rates.
   - Single-period random cash flows : Random asset returns ; portfolios of assets ; portfolio mean and variance, feasible combinations of mean and variance; mean-variance portfolio analysis : the Markowitz model and the two-fund theorem ; risk-free assets and the one-fund theorem.
   - CAPM : The capital market line ; the capital asset pricing model ; the beta of an asset and of a portfolio ; security market line; use of the CAPM model in investment analysis and as a pricing formula.
2. **Options and Derivatives 20 lecture hours**
   - Introduction to derivatives and options ; forward and futures contracts ; options ; other derivatives ; forward and future prices ; stock index futures ; interest rate futures ; the use of futures for hedging ; duration-based hedging strategies ; option markets ; call and put options ; factors affecting option prices ; put-call parity ; option trading strategies : spreads ; straddles ; strips and straps ; strangles ; the principle of arbitrage ; discrete processes and the binomial tree model ; risk-neutral valuation.
3. **Corporate Finance 20 lecture hours**
   - Patterns of corporate financing : common stock ; debt ; preferences ; convertibles ; Capital structure and the cost of capital ; corporate debt and dividend policy ; the Modigliani-Miller theorem.

ECO-A-DSE-5-B(1)-TU

Tutorial Contact hours : 15

Contents

1

Deterministic Cash-flow & Project Evaluation

1.1. Introduction

...e continuous growth and diversity in business activities on the one hand and the growing importance of financial assets with new analytical tools in the field of finance on the other have brought forward ...e importance of financial economics in general and the investment theory and portfolio analysis in ...rticular. As a starting point of this analysis, we shall deal with the concepts of deterministic cash-...w stream, basic theory of interest, Net Present Value (NPV) and Internal Rate of Return (IRR) ...teria for project evaluation in this chapter.

1.2. Deterministic cash flow stream

...rmally an investment is defined in terms of a cash flow stream or sequence generated out of that ...vestment during any particular time period. So, it is the flow of returns (cash) to an investment ...dertaken by any investor. Such cash flows usually occur at some definite intervals and these flows ...clude both positive and negative cash flows. If there remains no uncertainty in these cash flows ...ch as interest receipts from banks (on fixed deposits) at regular intervals], we call it deterministic ...sh flow.

...the investor spends, say, ₹ 1 crore for initiating any investment project then it would imply a negative ...sh flow at the beginning of the investment project. However, in subsequent years the project may ...nerate positive cash flow to the tune of, say ₹ 2,00,000 p.m.

...hen any investment generates future income streams then there is a question of determining the ...esent value of the future income stream. Interest rate on investment is generally used to determine ...e present value of the future cash flow. Hence, interest rate is often called as the time value of ...oney.

1.2.1. Time Value of money

...n simple terms, the time value of money means the difference in the value of money when it is ...ceived at different points of time. Normally, the value of a certain amount of money is more if it is ...ceived today rather than at some future date.

...e can give three specific reasons for the differences in the value of money at different points of time :

(i) Inflationary pressure in an economy ;

(ii) Preference for current consumption over future consumption by any individual ;

(iii) Possibilities of investment opportunity before the investors to put their money in projects with an assured return.

...the inflationary pressure increases over time, the value of money or the purchasing power of money ...ill fall. Similarly, if individuals prefer present consumption more than the future consumption, ...en any postponement of present consumption would mean that the money which has not been

used for present consumption, should fetch sufficient return so that the future consumption can be increased sufficiently to compensate for the present sacrifice.

Further, money has a time value because any individual having some investible fund at present can invest it in some project that ensures a fixed rate of return on the principal amount per time period.

Thus, in financial analysis, the concept of time value of money is used to make a comparison between the cash flow at different points of time. The future value of an amount can be estimated by considering either a simple interest rate or a compound interest rate on the principal amount invested at present. Similarly, the present value of the future cash-flow stream can also be estimated using a definite discount rate. Again,

(i) the risks involved in any investment project, and

(ii) the time for which the present consumption is being deferred, would also determine the time value of money.

If an investment project is more risky, the investor would naturally expect more return from the project. Any uncertainty in getting the return makes the project more risky. Hence, to make an equivalence between the money available at present and the money available in future from a risky venture, adequate returns are to be added with future stock of money.

Further, an individual can be induced to defer his/her present consumption if the amount of money he lends at present can bring in returns sufficient to compensate for that sacrifice for a long time.

1.3. Basic Theory of Interest

Let us first start with the notion of simple interest.

- **Simple Interest** : In this case, an investment generates an interest income equal to 'r' (interest rate) times the original investment every year. Further, there may be 't' fraction of 1 year (say, 6 months = 0·5 year) and in that case the interest income will be 'rt' times the original investment.

- **General Rule** : If 'A' amount is invested at a simple interest rate of 'r' for 'n' number of years then the total value (V) to be received after 'n' number of years will be $V = A(1 + rn)$ .... (1.1)

Example 1.1

If A = ₹ 100, r = 10% = 0·1 and n = 5 years

Then V = 100 (1 + 0·1 × 5) = 100 × 1·5

= ₹ 150

Let t = fractional years (e.g. 5·5 years)

In this case, the total value received at a simple rate of interest (r) after 't' time period will be

$V = A(1 + rt)$ .... (1.2)

Example 1.2

If A = ₹ 100, r = 10% = 0·1 and t = 9·5 years

Then V = 100 (1 + 0·1 × 9·5)

= 100 (1·95)

= ₹ 195

- **Compound Interest rate :**

In case of compound interest rate, the interest rate is compounded yearly. Here, if an amount A is invested at a compound interest rate 'r' for 'n' number of years then the value received after that period is estimated by the following formula :

$V = A(1 + r)^n$ .... (1.3)

In this case, we get a geometric growth of 'A'.

If $n = 4$ years then

$A(1 + r)$ = Value after 1 year

$[A(1 + r)](1 + r) = A(1 + r)^2$ = value after 2 years

$[A(1 + r)^2](1 + r) = A(1 + r)^3$ = value after 3 years

and $[A(1 + r)^3](1 + r) = A(1 + r)^4$ = value after 4 years

Example 1.1

If A = ₹ 100, r = 10% = 0·1

and n = 4 years

Then $V = 100(1 + 0·1)^4$

= ₹ 146·41

Here, the investor earns interest on interest, i.e., interest is reinvested. This feature is called as 'compounding'. In case of simple interest, the interest amount is not reinvested. In that case, interest is earned in each period only on the original principal amount 'A'. In our compound interest formula (4), the expression $(1 + r)^n$ is sometimes called as 'future value interest factor' or 'compound value interest factor'.

In our example, this future value interest factor is $(1 + 0·1)^4$ = 1·4641

and V = 146·41

= 100 (1·1) × 1·1 × 1·1 × 1·1

= $100 \times (1·1)^4$

= 100 × 1·4641

= ₹ 146·41

So, in case of compound interest the future value of ₹ 1 invested for 'n' years at an interest rate of 'r' per year is ₹ $1 \times (1 + r)^n$.

In this compounding process, the value that the investor receives after 'n' years has four parts:

(a) The original principal amount.

(b) The interest earned on the original principal amount (viz. the simple interest) per year.

(c) The interest on interest (viz. the compound interest) earned per year.

(d) The accumulated sum at the end of the period.

This can also be presented in a tabular form (Table - 1.2).

Table - 1.2

Future Value of ₹ 100 invested for 4 years at an interest rate of 10% p.a.

Year	Value at the beginning of each year (₹)	Simple interest (₹)	Compound interest (₹)	Total interest (₹)	Value at the end of each year (₹)
1	100	10	—	10	110
2	110	10	1·00	11	121
3	121	10	2·10	12·10	133·10
4	133·10	10	3·31	13·31	146·41
Total		40	6·41	46·41	

[illegible] year but the amount [illegible] the help of a diagram [illegible]

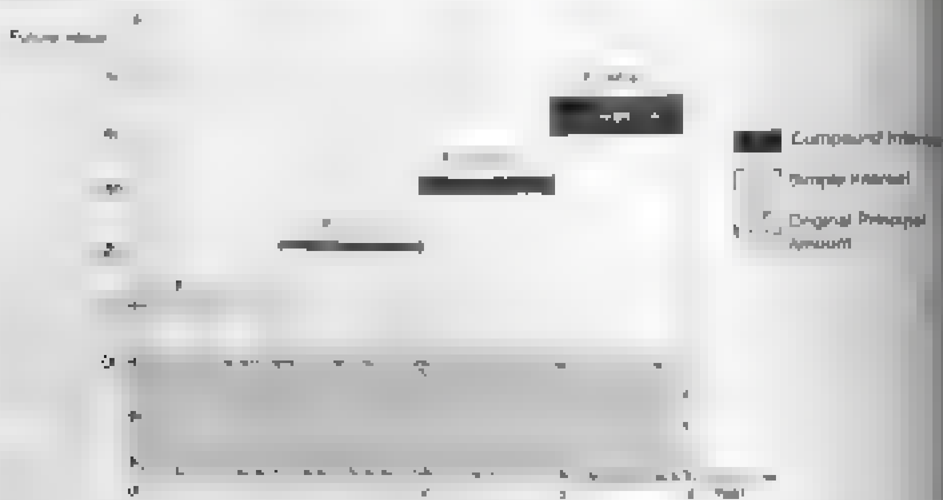


Fig. [illegible]

- **[illegible] RULE**

This rule suggests that if some amount is invested at an interest rate of say [illegible] per cent per annum [illegible] doubled in approximately [illegible] years, then that amount invested at an interest rate of [illegible] would be doubled in approximately [illegible] years. Generally, if an amount A invested at an interest rate of r p.a. gets doubled in n years

then $A(1+r)^n = 2A$

or, $(1+r)^n = 2$

or, $\ln(1+r)^n = \ln 2$

or, $n \ln(1+r) = 0.69$

It can be shown that for a very small value of r (normally less than 20% p.a.), an amount A [illegible] doubled in approximately $\frac{72}{i}$ years, where $i = 100r$

Example 1.4

If ₹ 1 is invested at an annual fixed interest rate of 10% = 0.1

then it would take $\frac{72}{10} = 7.2$ years (approx) for ₹ 1 to grow ₹ 2. In reality however [illegible] = 2, i.e., 7.3 years would be required to make ₹ 1 to grow upto ₹ 2 at 10% interest rate p.a. Similarly, it can be stated that if ₹ 1 is invested at an annual fixed interest rate of 7% then it would take $\frac{72}{7} = 10.2$ (approx) years for ₹ 1 to grow to ₹ 2

1.3.1 Nominal and real interest rate

When the interest rate is expressed in money terms, it is called nominal interest rate. For example, consider a person who has earned ₹ 100 as interest income by lending ₹ [illegible] for one year to another

[illegible] the nominal interest rate would be [illegible] per annum.

[illegible] the real interest rate [illegible]

[illegible] suppose that an individual [illegible] at an interest rate of [illegible] per annum [illegible] he will get ₹ [illegible] interest earned.

[illegible] suppose that the consumer price index shows [illegible] average price of consumer goods [illegible] the nominal income of the individual [illegible] the price index, we get the real [illegible]

[illegible]

It implies that compared to the base year his present income of ₹ [illegible] can only purchase goods worth ₹ [illegible] hence he is actually earning an interest income of ₹ [illegible] i.e. the interest rate [illegible]

[illegible] = 1.85% i.e. almost equal to 2% [illegible] shows the real interest rate.

Generally, the real interest rate is calculated as follows:

Real interest rate = Nominal interest rate − inflation rate

$$= 10\% - 8\% = 2\%$$

Alternatively, it can be estimated as follows:

$$\text{real interest rate} = \frac{(1 + \text{nominal interest rate})}{(1 + \text{inflation rate})}$$

$$\text{or, real interest rate} = \frac{(1 + \text{nominal interest rate})}{(1 + \text{inflation rate})} - 1$$

∴ In our example,

$$\text{real interest rate} = \frac{(1 + 0{\cdot}10)}{1 + 0{\cdot}08} - 1 = \frac{1{\cdot}1}{1{\cdot}08} - 1$$

$$= 1{\cdot}0185 - 1 = 0{\cdot}0185 = 1{\cdot}85\%$$

Thus real interest rate falls with an increase in inflation rate and vice versa.

Example 1.4(a)

Suppose you got ₹ 1,070 on maturity of a deposit of ₹ 1,000 for one year. If the inflation rate for that year was 5%, what was the rate of interest you actually received on your deposit?

[C.U., B.Sc. (H), Sem-V, 2021]

Solution

Here, ₹ 1,070 = 1,000 (1 + r)

$$\text{or, } \frac{1{,}070}{1{,}000} = (1 + r)$$

or, $r = 1{\cdot}07 - 1 = 0{\cdot}07$ or 7%

So, real rate of interest = 7% − 5% = 2%

where 5% = inflation rate.

1.4 Cash flow streams – Future Value

[illegible]

Example 1.5

[illegible]

1.4.1 Semi-annual compounding

[illegible]

Example 1.6

[illegible]

Where A = Principal amount

r = annual rate p.a.

m = frequency of compounding per year

t = No. of years for which compounding has to be done

V = Value received at the end of the period.

[illegible]

1.4.2 Quarterly compounding

When interest rate is compounded after every three months i.e. there will be four compounding periods in a year at a rate of $\frac{1}{4}$ th of annual interest rate, then it is called as quarterly compounding.

Here also we can use the formula $V = A\left(1 + \frac{r}{m}\right)^{mt}$ to determine the value received (V) at the end of the period.

For example, if A = ₹ 5,000, r = 10%, m = 4 and t = 2 years then

$$V = 5000\left(1 + \frac{0.1}{4}\right)^{4\times 2}$$

$$= 5000\,(1.025)^8$$

$$= 5000\,(1.2184) = ₹\ 6092$$

1.4.3 Monthly compounding

When the interest rate is compounded at the end of every month within a given year, it is called monthly compounding. So in this case there will be 12 compounding periods within a given year. We can use the same formula (1.4) as before to determine the value received at the end of the investment period.

Continuous compounding

Let us consider our previous formula

It can be expressed as

Hence $e = \lim_{n \to \infty}\left(1 + \frac{1}{n}\right)^n$ …

$V = Ae^{rt}$ (1.6)

It implies that V grows exponentially at the rate of r

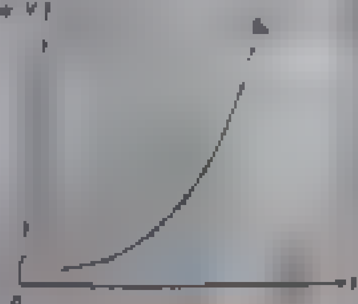


Fig. 1.1

Effective interest rate

The effective interest rate (r_E) satisfies the relation $1 + r_E = \left(1 + \frac{r}{m}\right)^m$ (1.6)

In case of continuous compounding a full year is divided into smaller segments, and we get

$1 + r_E = e^r$ in case of continuous compounding

or $r_E = e^r - 1$ (1.7)

Now if $r = 10\%$ then $e^{0.1} = 1.105$

[Students can calculate this value using scientific calculator (Made … CORPLEX)].

$r_E = 1.105 - 1 = 0.105 = 10.5\%$.

Again, if $r = 8\%$, $m = 2$ (i.e. semi-annual compounding)

Then, $1 + r_E = \left(1 + \frac{0.08}{2}\right)^2$

or, $r_E = (1.04)^2 - 1$

$= 1.0816 - 1$

$= 0.0816$

or 8.16%

Therefore $r_E > r$.

Compounded Sum of an Annuity

[illegible]

Future Value of a deferred annuity

[illegible]

[illegible]

This result shows the future compounded value of a deferred annuity of ₹

Future Value of an annuity due

When the cash flows occur regularly at the beginning of each period, the annuity is called an annuity due.

In this case the future compounded value of the annuity due can be calculated using the following formula:

[illegible] $(1+r)$ ...... (1.8)

- **Proof:** In this case, the cash flow generates the following G.P. series

[illegible]

and the future value becomes

$V = (1+r) + (1+r)^2 + (1+r)^3 + \ldots + (1+r)^n$ ...... (1)

Multiplying both the sides of (1) by $(1+r)$, we get

$(1+r)V = (1+r)^2 + (1+r)^3 + (1+r)^4 + \ldots + (1+r)^{n+1}$ ...... (2)

Now, subtracting (1) from (2), we get

$rV = -(1+r) + (1+r)^{n+1}$

$= (1+r)\left[(1+r)^n - 1\right]$

Example

1.6 Discounting and Present Value

Annual discounting and Present Value of a Single Cash Flow

1.6.2 Multi-period discounting and Present Value of a Single Cash Flow

where P = Present value

Amount of cash flow received in some future time period

frequency of discounting per year

n = Number of years

… is expressed as follows:

$$P = \left[\frac{1}{\left(1+\frac{i}{k}\right)^{kn}}\right] \quad (1.12)$$

Example 1.16

… the present value of ₹ … at an interest rate of …% receivable at the end of … years and discounting is done half yearly, then the present value of that future cash flow will be:

Example

3.3 Present Value of a series of cash flows

... is considered as the Present Value Interest Factor ...

[illegible] between Present Value and Future Value

[illegible]

[illegible] Present Value of an Annuity

[illegible]

Annuity Discount Factor

[illegible] Present Value of deferred annuity

[illegible]

Example

Solution

We can calculate the present value by using the

Present Value of a perpetual annuity

... discounting this cash flow stream then the present ...

5.6 Present Value of Annuity due

Example

6.0 Present value with continuous compounding

[illegible] compounded continuously at [illegible] equally spaced periods [illegible]

Net Present Value (NPV)

[illegible] referred proposals. The following steps are [illegible] project.

[illegible] market [illegible] alternative [illegible]

[illegible] the market [illegible] capital)

[illegible] Net Present Value (NPV) has to be estimated by subtracting the aggregate PV of all cash [illegible] from the aggregate PV of all cash inflows.

1.7.1 Evaluation of an Investment Project

[illegible] proposal can be evaluated on the basis of the NPV of the possible cash flows [illegible] project.

[illegible] the project should be accepted. However, the project should be rejected if NPV [illegible] remains indifferent between its acceptance and rejection.

- Conventional cash flows

[illegible] is expected to occur only at the start of the investment project then such pattern [illegible] is considered as the conventional cash flows.

Solution

[illegible]

Machine X

[illegible]

Machine Y

[illegible]

[illegible] the proposal relating to the purchase of Machine [illegible]

Tabular Presentation

Year	Machine X Cash inflows (₹)	PVIF	PV (₹)	Machine Y Cash inflows (₹)	PVIF	PV (₹)
1	[illegible]	0.8696	[illegible]	[illegible]	0.8696	[illegible]
2	[illegible]	0.7561	[illegible]	[illegible]	0.7561	[illegible]
3	[illegible]	0.6575	[illegible]	[illegible]	0.6575	[illegible]
4	[illegible]	0.5718	[illegible]	[illegible]	0.5718	[illegible]
5	[illegible]	0.4972	[illegible]	[illegible]	0.4972	[illegible]
Total			[illegible]			[illegible]
Less: Cash outflows			[illegible]			[illegible]
NPV			₹ [illegible]			₹ [illegible]

NPV < 0 for Machine [illegible]

and NPV > 0 for Machine [illegible]

[illegible]

Example

Solution

... both the projects that NPV of Project ... is greater than that of Project ...

Merits of NPV method

... merits and demerits of the NPV method.

Merits of the NPV method

... investment project has several merits

- ... method explicitly recognizes the time value of money. ... this method takes into ... the future income stream of any investment project while ...
- ... benefits ... of any investment project over the life-span of the project are also taken into account in the NPV method.
- This method is also capable of accommodating changes in the cost of capital by changing the ...

Internal Rate of Return (IRR)

Present Value (PV) Factor

If the normal rate of interest is assumed to be 5% then this project is accepted since IRR > 5%

When annual cash inflows taken are not equal over the life of the project. In this situation, the procedure of estimating IRR can also be explained with the help of following illustration.

[illegible]

Example

[illegible]

Solution

[illegible]

[illegible]

Discount Rate (%) [illegible] Present Value (PV) Factor

[illegible]

[illegible] This may be [illegible]

[illegible]

If the market rate of interest is assumed to be 9% then this project is accepted since IRR > 9%.

Example 24

[illegible]

[illegible] based on IRR [illegible]

10.1 [illegible]

10.1.1 Merits of the IRR method

[illegible]

10.1.2 Demerits of the IRR method

[illegible]

[illegible] method does not use the concept of [illegible] whereas it [illegible] the rate of return [illegible] of the profitability of investment proposal.

The results under this method [illegible] inconsistent compared to NPV method if the projects differ in their expected lives, investment or timing of cash inflows.

10.3. Relationship between NPV and IRR

[illegible] discounted cash flow techniques of evaluating capital investment decisions. We have seen that three important properties must be satisfied [illegible] investment appraisal method, and these are:

The method should consider all cash flows throughout the entire life of an investment project.

The method must consider the time value of money; and

If the method is used to select from a set of mutually exclusive projects (i.e. those projects are capable of performing the same task for the firm and hence if one of them is accepted, the others will be rejected), it must choose that project which will maximise the current value of the [illegible]

10.4. Similarities between NPV and IRR

[illegible] NPV and IRR methods [illegible] and both lead to identical decisions regarding [illegible] investment proposals [illegible] the IRR [illegible] less than the IRR [illegible] NPV [illegible] it implies that NPV [illegible] implies that NPV [illegible]

[illegible] all the estimated cash flows [illegible] are either positive or zero, NPV or IRR [illegible] give same decision of project evaluation.

[illegible] When a project is accepted [illegible] we get

[illegible]

[illegible] IRR we have

[illegible] (2) where [illegible] = IRR

[illegible] substituting the value of [illegible] shown in (2) in (1) we get

[illegible]

[illegible]

Conflict between NPV and IRR

	Project	Project
Internal Rate of Return (IRR)	[illegible]	[illegible]
NPV	[illegible]	[illegible]
Ranking		
Using IRR	[illegible]	2nd
Using NPV	2nd	1st

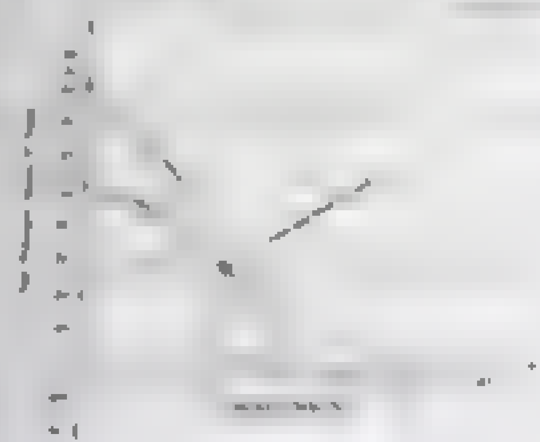


Fig.

[illegible]

Summary

[illegible]

The present value of a single cash flow is measured by using the formula

$P = [illegible]$ where P = Present value,

[illegible] amount of cash flow at some future time period [illegible] given interest rate (or discount rate). [illegible] multi period discounting of a single cash flow is done by using the formula

$P = [illegible]$ Similarly in case of continuous discounting we use the formula

[illegible]

In case of a stream of cash flows the present value is estimated by using the formula $P = \sum_{t=0}^{n} \frac{A_t}{(1+r)^t}$

The present value and the future value of a cash flow stream are related in the following way: $PV = \frac{FV}{(1+r)^n}$

where FV = Future Value of a cash flow stream. The present value of a deferred annuity is estimated with the help of the following formula: $P = A\left[\sum_{t=1}^{n} \frac{1}{(1+r)^t}\right]$ where $\sum \frac{1}{(1+r)^t}$ = Present Value Annuity Factor

The present value of a deferred annuity is measured by the formula

$P = A\left[\frac{(1+r)^n - 1}{r(1+r)^n}\right]$ where A = Deferred annuity

Similarly the present value of a perpetual annuity is estimated by the formula

$P = A [illegible]$ where A = The perpetual annuity

The present value of annuity due is estimated by the formula

$P = A [illegible] (1+r)$ where A = Annuity due

In case of continuous discounting the present value (PV) of a future cash flow is estimated as

$$PV = \sum_{t=0}^{n} \frac{A_t}{e^{rt}} = \sum_{t=0}^{n} A_t e^{-rt}$$

An investment project is accepted if NPV > 0, and the investment project is rejected when NPV < 0, where the Net Present Value (NPV) is estimated as $NPV = \sum_{t=1}^{n} \frac{A_t}{(1+r)^t} [illegible] \geq 0$

where A_t = Cash outflow at the initial period.

Assignment

Short answer type questions

What is a deferred annuity

Long answer type questions

2 Bond Price, Yield Rate & Term Structure

2.2 Bonds – Basic Concept

2.2.1 Main features of a bond

2.3 Bonds – Different Types

Maturity

Bond price and yield

[illegible]

[illegible]

[illegible]

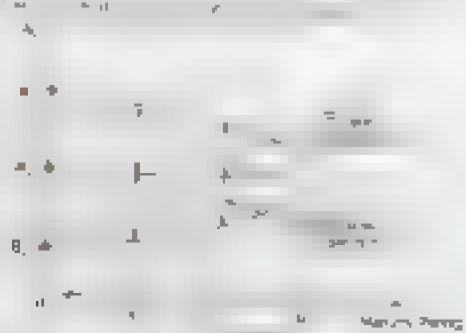
[illegible] bond is sold at its face value or par value then YTM = coupon rate.

Example 2.7

Example 2.8

Bond Price Theorem

Example 2.15



Example 2

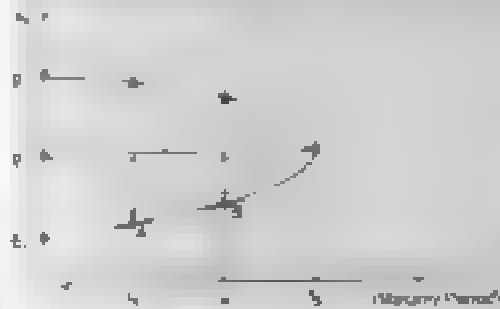


Fig. 2.4

Thus, the discount amount falls by

Hence, as the life of the bond gets shorter the discount in this case declines at an increasing rate. This can also be shown with the help of a diagram (Fig. 2.4).

When a bond is sold at a discount then the size of that discount

[illegible]

Example 2.13

[illegible]

However, [illegible] the market price will decline [illegible]

Thus, the bond price falls by

[illegible]

However, if the yield [illegible] declines [illegible] then the market price of the bond [illegible]

[illegible]

Example 2.12

[illegible] bond-1 and bond-2 with the following features

[illegible]

[illegible] then the market price of bond-1 will decline to [illegible]

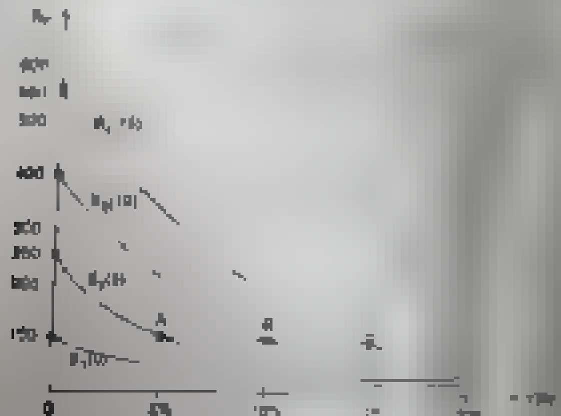
[illegible] the percentage change in bond price is [illegible]

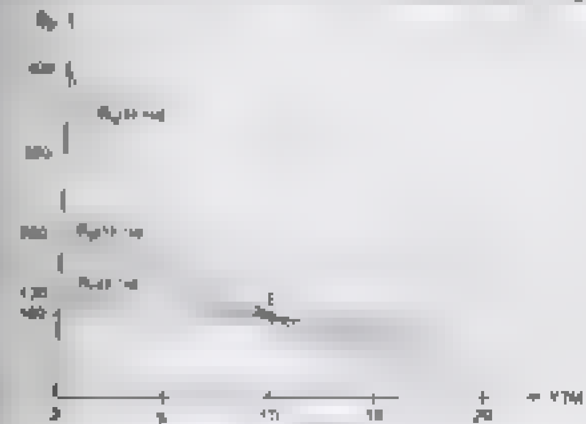
[illegible] Then the market price of bond-2 will be ₹ 97.42

[illegible]

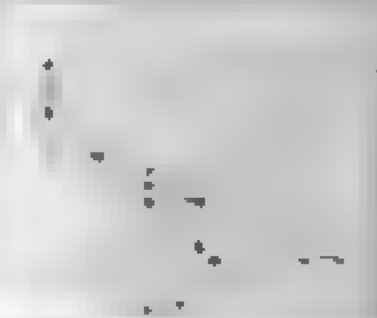
Convexity in bond valuation

2.3.2 Qualitative nature of price-yield curve : More discussion





Interest rate risk and price-yield curve



[illegible]

[illegible] coupon rate per period

[illegible]

Example 2.1[illegible]

[illegible] with a face value of [illegible] coupon rate of [illegible] [illegible] after a maturity period of [illegible] years. [illegible] at present. Calculate [illegible] bond.

[illegible] with the only difference that the [illegible] coupon rate is paid annually [illegible] of the bond.

[illegible]

[illegible]

[illegible] Example [illegible]

[illegible] Solution [illegible]

[illegible] modified duration of a bond is [illegible] change in the yield rate (YTM) of the bond [illegible]

[illegible]

[illegible]

[illegible]

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

[illegible] that as the yield [illegible] from [illegible]% to [illegible]%, the bond price falls by [illegible]%.

[illegible]

Properties of duration

Example

[illegible] a bond with [illegible] will be higher [illegible]

[illegible]

Example [illegible]

[illegible]	Low Yield Bond		High Yield Bond	
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

[illegible]

Example [illegible]

[illegible]

Example [illegible]

[illegible] the zero-coupon bond [illegible]

[illegible]

[illegible]

2.5.1 Duration of a portfolio of bonds

[illegible]

Example [illegible]

[illegible]

[illegible] have different [illegible] the present values of [illegible]

[illegible] the modified duration of the portfolio [illegible]

[illegible] increase in the [illegible] then the average bond price of the portfolio will [illegible]

4. Immunization

[illegible] The portfolio is [illegible] This technique immunizes [illegible]

[illegible] depends upon the purpose of that [illegible] with examples [illegible]

Example 2.4

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

Spot Rate of Interest

Table 3

Maturity period	Spot rate (%)	Spot rate (%)
[illegible]	[illegible]	[illegible]

[illegible]

2.5.2 Discount factor

[illegible]

compounding [illegible]

[illegible]

[illegible] value ₹ 1000 to find the 3-year spot [illegible]

Theories related to Term Structure

The expectation theory

[illegible]

2.n.3 Liquidity Premium Theory

[illegible]

Example [illegible]

[illegible]

[illegible] segmentation theory

[illegible]

[illegible]

[illegible] The [illegible] Theory

[illegible]

[illegible]

[illegible]

Assignment

[illegible] Questions

[illegible]

See Subsection 2.2.[illegible]
See Subsection 2.2.[illegible]

[illegible]

[illegible]

3

Random Cash Flow and Portfolio Analysis

1 Introduction

[illegible]

3.7 [illegible]

[illegible]

Example [illegible]

[illegible]

the simple arithmetic mean [illegible]

[illegible]

Example 3

[illegible]

[illegible] the average rate of return [illegible] the simple arithmetic mean is [illegible] the average [illegible] in determining the [illegible] we have to [illegible] the page [illegible]

Example 3.4

Stock	No. of shares	Price of stock (₹) (per unit)	Rate of return (%)
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]

Solution

Stock	No. of stocks	Price of stock (per unit) (₹)	Total cost (₹)	Weights of the stocks in portfolio (w_i)
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	Total value of the portfolio =		[illegible]	[illegible]

[illegible]

rate of return would be [illegible]

3.3 Random returns to an asset

Example 3

be shown with the help of a diagram (fig. 3.1).

Example 3.7

[illegible]

[illegible] Some important properties of expected value

[illegible]

Example 3.

[illegible]

[illegible]

[illegible] the probabilities of occurrence [illegible] during a given [illegible]

[illegible]	Probability of occurrence of the state	Rate of return on an asset under a given economic state	
		Stock A	Stock B
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]

[illegible] probability of occurrence of a state of the economy, the expected return from a [illegible]

[illegible]

3.3.2 Variance of a random Variable

[illegible]

Example 3.10

[illegible]

State of the economy	Probability of occurrence of the state	Rate of return on a financial asset under a given state of the economy	
		Stock A	Stock B
[illegible]	[illegible]	[illegible]	[illegible]

[illegible]

[illegible]

[illegible] Portfolios of [illegible]

[illegible]

Example

stocks in the portfolio are held in a proportion

[illegible] $\sum$ [illegible]

[illegible] in a similar way [illegible]

Example [illegible]

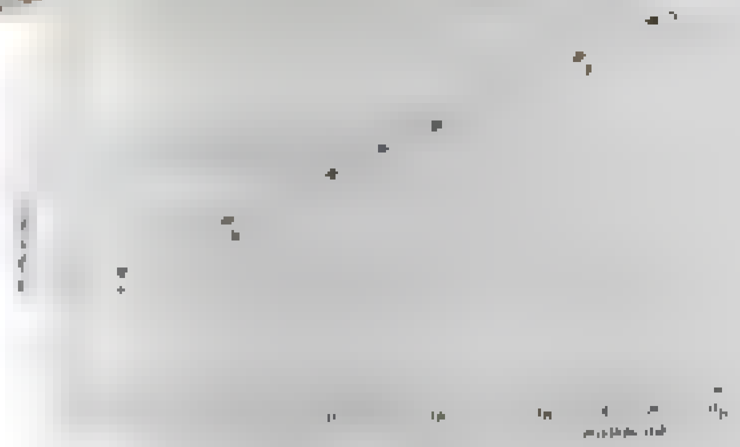
[illegible] financial assets [illegible] stock [illegible] variance of the [illegible] as well as the portfolio [illegible]

Solution

3.4.3 Systematic & Unsystematic risks

Diversification and portfolio risk

Risk-return profile of a two asset portfolio



Different proportions of two Stocks

Weightage

Expected return and risk

Fig. 4.4

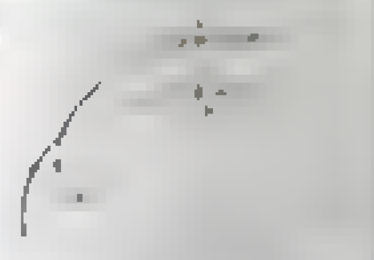
Prospects or the expected rate of returns from Stock-1 and Stock-2 are not correlated, i.e. $\rho_{12} = 0$

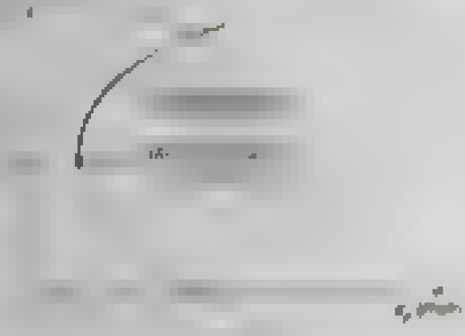
[illegible]

Feasible combinations of mean and variance: a concept of feasible set

[illegible] portfolio [illegible] [illegible]

[illegible]





[illegible]

[illegible]

[illegible]

$$= w_1^2\sigma_1^2 + w_1 w_2 \sigma_{12} + w_2 w_1 \sigma_{21} + w_2^2 \sigma_2^2$$

Two-fund Theorem

3.5.2 Inclusion of a risk-free asset in the portfolio

holding period is supposed to know with certainty what the

...considered as risk-free only when the maturity of that bond ... the holding period of the investor.

Therefore, the portfolio return can be expressed as

Example 3.1[illegible]

[illegible]

	Portfolio	A	B	C	D	E
(i)	Risk free asset	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
(ii)	Risky asset	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Estimate the corresponding risk return of all these portfolios.

Solution

For the risk-free asset, the expected rate of return [illegible]

[illegible]

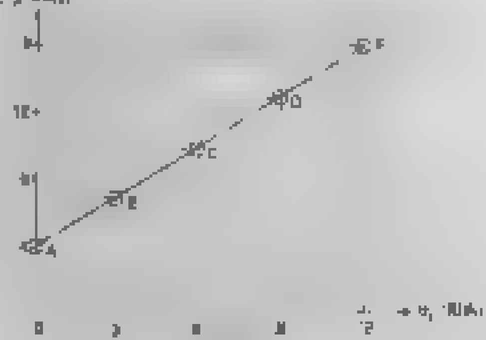


Fig. [illegible]

3.5.3 Investing in both risk-free asset and a risky portfolio

[illegible]

Example 3

[illegible]

Risky Stocks	Expected rate of return	Standard deviation of the rate of return
Stock 1	[illegible]	[illegible]
Stock 2	[illegible]	[illegible]

Covariance of prospects between stock 1 and 2 [illegible]

The risk-free asset's expected rate of return is assumed to be [illegible].

- Estimate the portfolio risk and return for the risky portfolio assuming [illegible] of stock 1 and [illegible] of stock 2.
- Estimate the portfolio risk and return for a portfolio created out of a combination of the risky portfolio and the risk-free asset with the following weights.

[illegible] rate of return of the portfolio consisting of risky stocks (Stock 1 and 2) will be [illegible]

[illegible] return on risky portfolio is [illegible]

Since $\sigma_p^2 = w_1^2\sigma_1^2 + w_2^2\sigma_2^2 + 2w_1w_2\sigma_{12}$

[illegible]

[illegible] risk-free asset is considered with the risky portfolio, then the expected rate of return of the [illegible]

[Considering that [illegible] weightage for risky portfolio and [illegible] weightage for risk-free asset]

[illegible] standard deviation of the rate of return of the new portfolio will be [illegible]

Where σ_r^2 [illegible] standard deviation of rate of return on risky portfolio

[since $\sigma_f^2 = 0$ for risk-free asset, and $\sigma_{rf} = 0$]

[illegible]

[illegible] risk-return portfolio in a diagram

[illegible] portfolio lies along on the efficient frontier of Markowitz [illegible] denoted by [illegible]. [illegible] combined with the risk-free asset we get the capital allocation line originating [illegible]

2.5.4. Risk-free lending and the efficient portfolio

Example 3.17

Solution

(i) When the investor combines a risky fund ... the risky portfolio with the risk free asset the expected rate of return on combined portfolio is expressed as

Where ... proportion of risky assets in the portfolio

... expected rate of return on risky assets

... proportion invested in risk free asset in the portfolio

... risk-free rate of return

The variance of the rate of return on the portfolio will be

Where σ_{rf} = Covariance of the prospects of risky assets and risk-free asset.

ρ_{rf} = Correlation coefficient of the prospects of risky assets and risk-free asset

Since, $\sigma_f^2 = 0$ and $\rho_{rf} = 0$ so $\sigma_p^2 = \alpha^2\sigma_r^2$

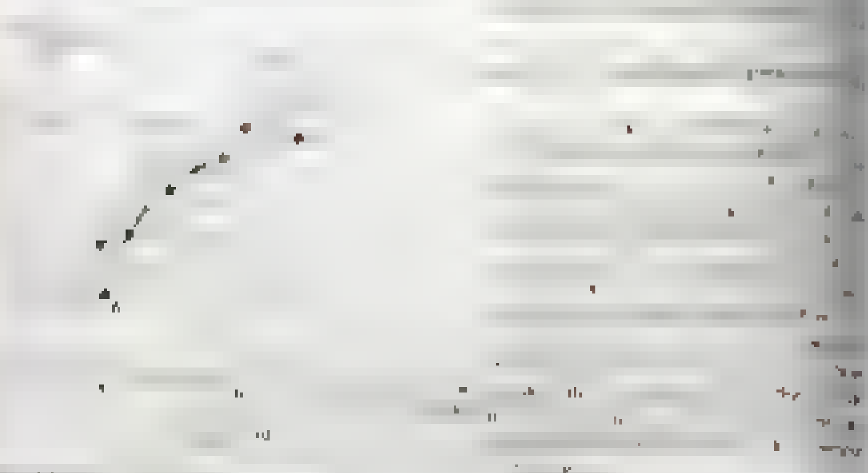
$\sigma_p = \alpha\,\sigma_r$

... with respect to ... and setting the equation ... the optimal ... as follows:

So the investor should invest 63.16% of his fund in Stock ..., and the remaining 36.84% ... in Stock-Z

3.5.6 Utility function of the investor and optimal portfolio

3.8.7 Borrowing and lending at risk-free rate and optimal portfolios



... and the utility function of investor-B is

... So, the indifference curves of investor-A (denoted by IC_A^0 and IC_A^1) are steeper compared to the indifference curves of investor-B (denoted by IC_B^0 and IC_B^1) ...

... of the optimal portfolio would be ... See Fig. 3.19.

Example 3.10

... risky portfolio and A = Coefficient of risk aversion, ... the risk-free rate of return ...

Solution

... Proportion of fund invested in risky assets ...

[illegible]

Capital Asset Pricing Model (CAPM)

[illegible]

[illegible] market portfolio.

[illegible] market equilibrium and market [illegible]

[illegible] We have seen that the proportion [illegible]

[illegible]

Stock	No. of shares	Relative share in the market	Price per share	Capitalization	Weight of stock
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

[illegible] with regard to the [illegible] through their buying and selling activities, equilibrium will [illegible] the stock prices will [illegible] the market [illegible]

[illegible] that the stocks which are frequently traded [illegible] the market equilibrium.

[illegible] portfolio [illegible] mean variance [illegible] would also represent the market portfolio.

[illegible] assumptions [illegible] CAPM

[illegible]

[illegible] The [illegible] Market [illegible]

[illegible]

[illegible] rate of return on any efficient [illegible]

[illegible] the capital market line [illegible]

[illegible]

[illegible] price of risk [illegible] the risk premium [illegible]

[illegible]

... the security market line as shown in equation ...

... market line as suggested by CAPM shows

... Risk-free return + Market risk premium × Beta of security

... the security market line ... The slope of the security market line (SML) ...

... shows the market risk premium

... reflects the expected rate ... the market portfolio as a whole. It also implies that the excess return on a stock ... varies proportionately with the excess return on the market portfolio ...

Fig. ...

3.6.4. Relationship between SML and CML

We have already shown the equation representing the capital market line (CML). This is ... below

(eq 3.32)

Systematic risk, Non-systematic risk and security market line

[illegible]

3.6.6 Beta (β) of a portfolio

[illegible]

Example 3.8

[illegible]

Solution

[illegible]

$= 4 + 0.08\,\sigma_{iM}$

[illegible]

$= 257$

[illegible]

Next, the beta value of each security can be calculated as follows

[illegible]

Note: The expected rate of return on Stock 1, 2 and 3 based on SML will be

[illegible]

[illegible]

Example [illegible]

[illegible] expects that the equity share holders of this enterprise should get a return of [illegible] [illegible] The risk free rate of return on government bonds [illegible]

Solution

In the case of CAPM, the expected rate of return on ith asset would be

[illegible]

[illegible]

3.4.6 Use of CAPM as pricing formula

Example 3.20

Solution

Example [illegible]

An investor has the following information regarding the expected value of a [illegible]

[illegible]

Example [illegible]

[illegible]

[illegible]

[illegible]

[illegible] the expected value [illegible]

[illegible]

[illegible] random variables [illegible]

[illegible] covariance of random variables is measured by the covariance [illegible]

[illegible]

[illegible] portfolio of assets will be

[illegible] where [illegible]

[illegible] measured as follows

[illegible]

[illegible] can be expressed as follows

[illegible]

[illegible]

An Introduction to Financial Economics

[illegible]

Security Market Line

[illegible] Capital Market Line is expressed as

[illegible]

Assignment

Short-answer type questions

1. What [illegible] by return on investment? (See Section 3.2)
2. What are the [illegible] of total return on investment? (See Section 3.2)
3. How can [illegible] return on investment? (See Section [illegible])
4. How [illegible] return on investment of financial assets can be estimated? (See Section 3.[illegible])

[illegible]

[illegible] of the expected value of a random variable [illegible]

13. Distinguish between systematic and unsystematic risks. (See Subsection ...)

14. Explain how and to what extent the portfolio risk can be minimised through ...

15. "Portfolio risk cannot be brought down to zero through diversification ..." Explain.

... Also calculate the minimum variance for a given ... portfolio. (See Section ...)

... the following vector of expected rate of return on three stocks (Stock 1, 2 and 3) and the variance-covariance matrix (V) of these stocks:

[illegible] to lend and borrow at risk-free [illegible]. Now using the utility function of the investor [illegible] the efficient portfolio [illegible] Markowitz curve and the capital allocation line [illegible]

[illegible] rate of return.

[illegible]

$$U = E(r) - 0.5A\sigma^2$$

where A = coefficient of risk aversion.

[illegible]

State the basic assumptions of CAPM

[illegible] CAPM

(See Subsections [illegible])

[illegible] capital market line [illegible]

[illegible] capital market line and security market line [illegible]

[illegible] portfolio beta (β). (See Subsection [illegible])

[illegible] standard deviation of [illegible] risk-free rate of return [illegible]

[illegible] market values and beta (β):

Stock	Market Value (₹)	Beta (β)
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]

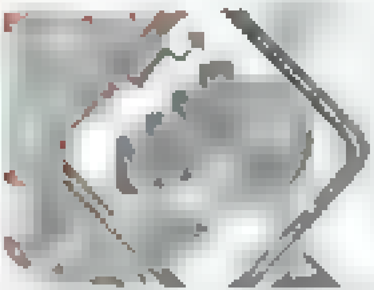
[illegible] and the market rate of return [illegible] calculate [illegible] expected rate of [illegible] based on CAPM.

[illegible] security market line then [illegible] the expected rate of [illegible] portfolio and [illegible] the risk-free rate of return:

[illegible] (See Subsection [illegible])

[illegible]

[illegible]



4 Derivatives and Options

4.1 Introduction

After going through this chapter the reader will be able to:

4.2 Derivatives – Basic Concept

4.2.1 Meaning of Derivatives

(b) A word formed by derivation

History of Derivatives Trading

... exchange-traded currency futures in 1973

4.3 Types of Derivatives

Forward Contracts

... who agrees to buy in future is said to hold long position.

... agrees to sell in future is said to hold short position.

... Demerits of Forward Contracts are as follows:

- Requires tying up capital. There are no intermediate cash flows before settlement.
- Subject to default risk.
- Contracts may be difficult to cancel.

... forward exchange rate contract.

Illustration [illegible]

[illegible]

(b) Forward Premium for 3 months ₹ 0.37

Solution

The Rupee expenditure to US $ purchased in forward market for delivery in 3 months as follows

$ [illegible] (₹ [illegible] + 0.37) = ₹ [illegible]

[illegible]

[illegible]

Amount payable [illegible]

[illegible] spot rate prevails at ₹ [illegible] the cash flow would be as follows

[illegible] payable to the bank = $ [illegible] × ₹ [illegible] = ₹ [illegible]

[illegible] forward [illegible]

[illegible]

[illegible] Future Contracts

[illegible] agrees to take delivery at an agreed price [illegible] in the future in a specified market. Future contract is different from forward contract [illegible] traded on an organised exchange [illegible] guarantee will be [illegible] whereas in forward it will be the counter party risk.

[illegible] currency rates and share prices by taking a position that is equal and opposite [illegible]

[illegible] obligates the buyer to purchase the underlying contract and the seller to sell it [illegible] before settlement date which may happen in order to take a [illegible] In practice only a very small percentage of futures contracts result in delivery [illegible] underlying commodity or security.

Features of Future Contract

[illegible] commodity futures are contracts to buy or sell goods or assets at a future date [illegible] The following features are there for future contracts:

[illegible] contracts are traded on organised future exchanges. These are forward contracts traded [illegible] futures exchanges.

[illegible] contracts are standardised contracts in terms of quantity, quality and amount.

[illegible] is required to be deposited by the buyers or sellers in form of cash or securities [illegible] the deal. Margins are deposits which hedgers and speculators [illegible] for their futures position. As the value of a position may change daily the [illegible] used to ensure adequate collateral. The initial margin is based upon the value of [illegible] and its inherent risk as measured by its volatility.

[illegible]

Long hedging: When futures are bought against the price [illegible] hedge.

[illegible]

Short hedging: When futures are sold against the price decrease is known as short hedge [illegible] hedge. Explained in above example.

Optimal hedging ratio: It will determine how many future contracts should be bought [illegible] minimize the risk.

[illegible]

Illustration [illegible]

[illegible]

Solution

[illegible]

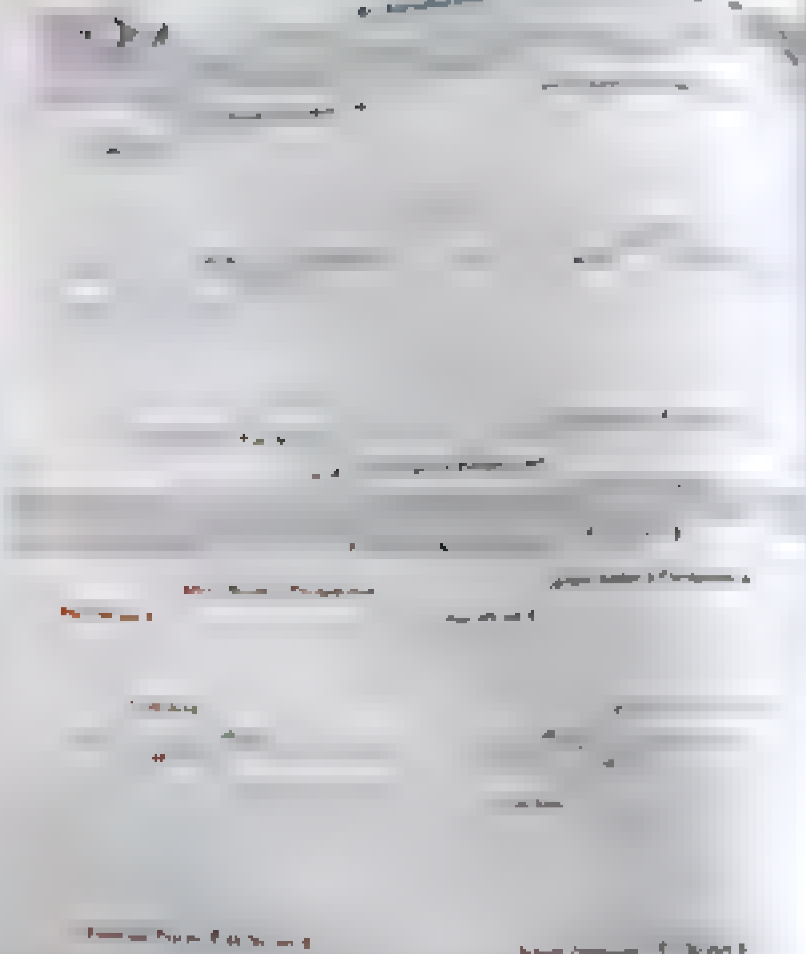


Fig. 4 [illegible]

[illegible] which give the option holder the right [illegible] obligation [illegible]

[illegible]

Difference between a futures contract and an options contract

4.3.4 Warrants and Convertibles

Difference between warrant and convertibles

Swap

Swap Mechanism

- Currency Swaps

Examples of Currency Swap

Forward Rate Agreement (FRA)

Example of an FRA

4.4 Hedging Strategies

[illegible]

Types of Hedging

[illegible] These are discussed below.

[illegible]

[illegible] at a future time will use short hedge through [illegible]

[illegible] cash flows at a future time will use short hedge [illegible]

[illegible] at a future time will use short hedge through interest rate futures.

[illegible] at a future time will use short hedge through government bond [illegible]

Some more Examples

4.5 Option Markets in India

4.5.1 Factors influencing option prices

4.5.2 Black & Scholes Option Pricing Formula

[illegible]

Illustration 4.4

[illegible]

(a) Stock sells at ₹ [illegible]

(b) Strike price of the Call and Put option = ₹ [illegible]

(c) Interest rate is [illegible]

(d) The SD of stock returns is [illegible]

(e) Compute the value of Call and Put Option.

Solution

[illegible]

- No. of days to expire [illegible]

[illegible]

Illustration 4.5

[illegible]

Solution

[illegible]

4.3 Put Call Parity Theorem

[illegible]

Value of call + PV of exercise price = Value of put + Value of share

Table 4.5

Put-Call Parity Theorem

[illegible]

Sensitivity Analysis

Delta is the ratio of change in option price to change in price

Delta Call $= dP_c / dP_s = N(d_1)$, value ranges from 0 to 1

Delta Put $= dP_p / dP_s$

Where P_c = Call option price, P_p = Put option price, P_s = Stock

R = Risk free interest rate, P_x = Exercise or strike price

It is 2nd order derivative of option w.r.t. to price $\left(\frac{d^2 P_c}{dP_s^2}\right)$

Trading Strategies in Option

Covered Call

Protective Put

Straddle and Strangle

Straddle

[illegible]

Case Study

[illegible] mainly invested in the equity of stocks traded on the Indian market. Since the Indian [illegible] doing very well from 2003 to 2008, this fund also did very well during this period. [illegible]

[illegible] and facing problems when the Indian stock market dropped considerably [illegible]

[illegible]

Question 7

Solution

Strip

[illegible]

Net cash flow = [illegible]

Gain from strip = INR 19,[illegible]

Question 8

[illegible]

Solution

[illegible]

Question 9

[illegible]

Solution

[illegible] Spread

[illegible]

7 Principles of Arbitrage

[illegible]

[illegible] value of futures

4.6 The Binomial Tree Model

[illegible]

The cost of constructing the hedge at the current time is [illegible]. The value of [illegible] would be either [illegible] with probability [illegible]

[illegible]

[illegible] the formula is independent of the [illegible] arbitrage pricing [illegible]

[illegible]

[illegible] binomial model is used to [illegible]

[illegible]

[illegible] time interval as % of year

[illegible]

[illegible] stock is currently traded in the market at ₹ [illegible]. A [illegible] year American call option on the [illegible] strike price of ₹ [illegible] is available in the market. The price of the stock in the [illegible] The risk free interest rate is [illegible]%.

[illegible] two step Binomial Model to find out the price of the two year American call [illegible] the company's stock.

[illegible]

[illegible]

[illegible]

Additional Numerical Problems

[illegible]

[illegible]

[illegible]

5. A State Bank share is selling at INR [illegible] on January [illegible]. It has a call option with maturity on March [illegible] with an exercise price of INR [illegible]. This option is selling for INR [illegible].
(i) On February 14, the State Bank share price is INR [illegible]. What is the intrinsic value? Is the option in the money? Would you exercise this option on February 14? Explain.
(ii) On February 14, the State Bank share price is INR [illegible]. What is the intrinsic value? Is the option in the money? Would you exercise this option on February 14? Explain.

[illegible]

The put option is [illegible] the money as stock price is below the exercise price.

[illegible]

6. State Bank share is selling at INR [illegible] on January [illegible]. It has a put option with maturity on March [illegible] with an exercise price of INR [illegible]. This option is selling for INR [illegible].
(i) On February 14, the State Bank share price is INR [illegible]. What is the intrinsic value? Is the option in the money? Would you exercise this option on February 14? Explain.
(ii) On February 14, the State Bank share price is INR [illegible]. What is the intrinsic value? Is the option in the money? Would you exercise this option on February 14? Explain.

Solution

[illegible]	[illegible]
[illegible]	[illegible]
[illegible] date	March [illegible]
[illegible]	[illegible]
February 14 share price	[illegible]

Intrinsic value = [illegible]

The put option is in the money as stock price is below exercise price.

Option exercise will depend on the value of the put on February [illegible]. [illegible]

(ii) [illegible] share price INR [illegible]

[illegible] as it is out of money (Stock price is above the exercise price)

[illegible] the option.

7. A State Bank share is selling at INR [illegible] on January 1. It has a call and a put option with maturity on March [illegible] with an exercise price of INR [illegible]. The call is priced at INR [illegible] and the put is priced at INR [illegible].
(i) [illegible] believe that the price of the State Bank share would be INR [illegible] on March [illegible], what action would you take?

On September 1, call and put options are available on the Bank Nifty index with expiry on September 30. The exercise price of these options is [illegible]. On September [illegible], the Bank Nifty index is at [illegible]. The call is priced at INR [illegible] and the put option is priced at INR [illegible]. The contract multiplier for the Bank Nifty index is [illegible].

(i) If on September 30, the value of the Bank Nifty index is [illegible], what will be the gain or loss for the call option buyer?

(ii) If on September 30, the value of the Bank Nifty index is [illegible], what will be the gain or loss for the put option buyer?

(iii) If on September 30, the value of the Bank Nifty index is [illegible], what will be the gain or loss for the call option writer?

On July [illegible], call and put options are available on the CNX Nifty index with expiry on September [illegible].

[illegible]

(iv) Can you exercise the call option on [illegible] stock on September 30 when the shares of ICICI Bank are selling at INR 840 ?

[illegible]

The contract size of Allahabad Bank options is 2,450. Allahabad Bank shares are selling at [illegible] on March 1. Call options and put options are available with expiry on April 29 and an exercise price of INR 100. The volatility of the stock price is [illegible]% and the risk-free rate is [illegible]%. Using the Black-Scholes options pricing model, calculate the call option price on March 1.

Solution

[illegible]

$N(d_2) - [illegible] N(d_1) = [illegible]$

The contract size of Allahabad Bank options is 2,450. Allahabad Bank shares are selling at INR [illegible] on March 1. Call options and put options are available with expiry on April 29 and an exercise price of INR 100. The volatility of the stock price is 15% and the risk-free rate is 8%. Using the Black-Scholes options pricing model, calculate the put option price on March 1.

Solution

[illegible] $= 8\%$, $T = \frac{[illegible]}{365}$ [illegible]

$= 0.[illegible]$

[illegible] 2,000,000 barrels of aviation fuel every month. Since the price of aviation [illegible] the price of crude oil, Jet Airways [illegible] price rise. At the beginning of each [illegible] for a long hedge in crude oil futures contract for 2,000,000 barrels [illegible] the end of that month.

(a) What is meant by a long hedge?

(b) What is the purpose of the long hedge undertaken by Jet Airways?

(c) [illegible] Jet Airways be able to completely eliminate the price risk of aviation fuel? Explain.

[illegible] means that the hedger needs to purchase a commodity or asset at a future time. [illegible] contracts to hedge the risk of price increase.

[illegible] every month and fuel prices are highly volatile. In order to [illegible] undertake a long hedge using futures [illegible]

Some Relevant Concepts & their narrations

How does interest rate risk affect a firm?

Impact of exchange rate risk on the value of a firm.

An Indian vegetable merchant exports fruits and vegetables to Singapore, pricing them in Singapore dollars. What price risk does he face and how can he reduce the risks

[illegible]

What is meant by basis and basis risk?

Basis is the difference between the spot price and the futures price of a[illegible] [illegible] arbitrage, basis on the maturity date of futures should be [illegible]

[illegible]

Under what conditions would a hedger not be able to get a perfect hedge using futures [illegible]

[illegible]

(a) The asset underlying the futures is different to the asset exposed to.

(b) The maturity date of futures is different from the date of end of exposure to the asset.

(c) The quantity of asset exposure is not an integer multiple of the contract size of the futures.

13. What type of hedging would be undertaken under the following circumstances?

(i) [illegible] Indian rupee futures [illegible]

(ii) [illegible]

(iii) [illegible] futures are available in the [illegible]

(iv) At the end of 3 months, Indian Company needs to sell US$ [illegible] a short position in US$ futures.

(v) [illegible]

(vi) Oil producer wants to sell oil at a future time, and will therefore take a short position [illegible]

14. Explain what happens to the position of a short hedger if the basis strengthens and if the basis weakens.

[illegible]

15. If the minimum variance hedge ratio is 1, does it mean that you can completely eliminate price risk?

Minimum variance hedge [illegible] there will still be basis risk.

What is the rationale for introducing currency futures?

[illegible]

Under what conditions would you make arbitrage profits?

[illegible]

What is the basic idea behind an interest rate swap?

[illegible]

What is a [illegible] swap?

[illegible]

What is a swaption? What are the uses of swaptions?

[illegible]

What are the differences between an interest rate swap and a currency swap?

[illegible]

Under what circumstances would you enter into a forward swap?

[illegible]

A swap contract can be considered as a series of forward contracts. Explain why.

[illegible]

Since exchange of payments takes place in different currencies in a currency swap, a currency swap [illegible] currency risk. Then why would anyone enter into currency swaps?

[illegible]

[illegible]

28. [illegible]

(g) Option premium [illegible]

29. Mention the difference between the positions of an option buyer and an option writer.

An option buyer gets the right to exercise the option [illegible]

30. Mention the circumstances under which an option would be exercised

[illegible]

31. Under what circumstances one would buy a call option

[illegible]

[illegible] would buy a put option

[illegible]

[illegible] would write a put option

[illegible]

[illegible] would write a put option

[illegible]

State minimum and maximum values of a call option and a put option

[illegible]

State the advantage of writing a covered call over writing a naked call.

[illegible]

How can one achieve portfolio insurance using put options?

[illegible]

Summary

Key Words

[illegible]

Call option is the option to buy an asset.

Put option [illegible]

Strike price [illegible]

European option [illegible]

American options [illegible]

[illegible]

Implied volatility [illegible]

[illegible]

Diagonal spread [illegible]

[illegible]

Long straddle [illegible]

Short straddle is the short ... same ... [illegible]

Spread is a trading strategy which can be created by ... options ... [illegible]

Straddle is ... strategy ... with the same strike prices.

Strangle is a position where ... buys a put and a call option with the same ... [illegible] with different strike prices.

Strap is a ... position ... two call and one put options with the same exercise price and same date of expiration.

[illegible]

Bearish call spread [illegible]

Bullish spread is the spread in which [illegible]

[illegible]

Assignment

Answer Type Questions

[illegible]

... the impact of exchange rate risk on the value of a firm (See Section 4.?)

[illegible]

What is ... currency swap? (See Subsection 4.?)

[illegible]

Patterns of Corporate Financing

9.2 Patterns/ Sources of Corporate Financing

Advantages of Equity Share

8.3.2 Preference Shares

[illegible]

(a) Participating preference shares: [illegible]

(b) Non-participating preference shares: [illegible] dividend at a fixed rate and do not enjoy the right to participate [illegible] such preference shares are called as non-participating preference.

[illegible]

Advantages of Preference Shares

[illegible]

[illegible] dividend [illegible] fixed rate of dividend [illegible]

[illegible] voting rights [illegible]

Disadvantages of Preference Share

Financial burden

Repayment

Difference between Equity Shares and Preference Shares

These are enumerated in the next pages.

[illegible]

Disadvantages of Debentures

[illegible]

From the point of view of the company

[illegible] from the following disadvantages of financing through debentures

[illegible]

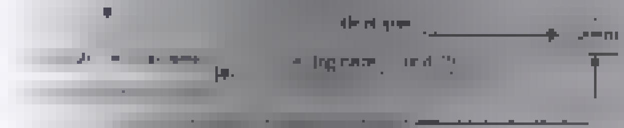
(iv) Fund raising during depression [illegible]

Features of Term Loan

Advantages of Term Loan

Features of Lease Financing

5.3.5 Lease Financing



■ Differences between Financial Lease and Operating Lease

Basis	Financial Lease	Operating Lease
Nature	[illegible]	[illegible]
Risk of asset	[illegible]	[illegible]
Purchase of asset	[illegible]	[illegible]

	Financial Lease	Operating Lease
[illegible]	[illegible]	[illegible]

[illegible]

Hire Purchase

[illegible]

[illegible] Hire Purchase agreement [illegible]

[illegible]

Hire Purchase System

[illegible]

Difference	Hire purchase	Lease Financing
Accounting	According to the hire purchase agreement [illegible] payment [illegible]	According to the lease [illegible]
Salvage value of the asset	The hire purchaser [illegible] salvage value of [illegible] of hire purchase agreement period.	The lessor [illegible] the salvage value of the asset after the [illegible] lease period.

Commercial Banks (Bank Financing)

5.3.12 Customer Advances

5.3.13 Trade Creditors

This source will also be discussed in chapter 7 of this book.

Sources

Retained Earnings: Ploughing Back of Profit

Provision for Depreciation

5.4.3 Provision for Taxation

5.4.4 Proposed Dividend

5.5 Venture Capital

Summary

Assignment

Objective Type Questions

6

Cost of Capital

6. Introduction

Meaning and Concept of Cost of Capital

... William and Donaldson ...

Importance, Relevance and Significance of Cost of Capital

Computation of Cost of Capital

Computation of Specific Cost of Various Sources/Components of Capital

[illegible]

[illegible] with the help of following formula

[illegible]

[illegible] therefore, do not require any [illegible] made either at the time of maturity or in a number of [illegible] payment made at the end of the year.

[illegible] depend upon the type and nature of debt. [illegible]

[illegible] the cost of debt can now be considered as follows:

- [illegible] Debt
  - Irredeemable debt
  - Redeemable debt
    - Repayment of principal [illegible] at the time of maturity
    - Repayment of principal [illegible] instalments

Cost of Perpetual/Irredeemable Debt

[illegible] as follows:

[illegible]

[illegible] after tax, K_d [illegible]

[illegible] annual interest payment

[illegible] proceeds from the issue of debt

= Applicable tax rate

Illustration 1

[illegible] debentures of ₹ 100 each. The company is in [illegible] tax bracket. [illegible] the cost of debt assuming that the debt is issued [illegible]

[illegible]

[illegible] in both the following situations:

[illegible]

Calculation of Net Income (NI)

	Situation (a)	Situation (b)
	₹	₹
EBIT	[illegible]	[illegible]
Interest	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
Net Income	[illegible]	[illegible]

Illustration 2

Solution

Redeemable Debt

Illustration 5

Solution

4.3.2 Cost of Preference Share Capital

Cost of Irredeemable Preference Shares (K_p)

Second method

Illustration

Solution

Cost of Equity Share Capital

Dividend Price Ratio Approach or Dividend Yield Method

Ratio Approach or Earning Yield Method

Solution

MPS = Market price per share or ₹

Illustration 15

... growth rate in earnings ... equity capital

Solution

Earnings Yield Approach

... Yield Method and 'Earnings ...

Cost of Retained Earnings

First method (from the point of view of equity shareholders)

...putation of Overall Cost of Capital or Weighted Average Cost of Capital (WACC)

[illegible] Weighted Average Cost of Capital [illegible] total [illegible] total capital [illegible]

Calculation of Weighted Average Cost of Capital

(Book Value as weights)

Source	Amount (₹) (2)	After-tax cost (%) (3)	Total after tax cost (₹) (4) = (2) × (3)
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]		[illegible]

[illegible] Average Cost of Capital [illegible]

[illegible]

(ii) Calculation of Weighted Average Cost of Capital

(Market Value as weights)

Source of Funds	Amount (₹) (2)	Proportion Weights (3)	After-tax cost (%) (4)	Weighted cost (5) = (3) × (4)
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible] share capital	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]		[illegible]

Weighted Average Cost of Capital (K_0) = [illegible]

[illegible] has been [illegible] Equity share capital and Retained Earnings [illegible]

[illegible] Retained earnings [illegible] with Equity share capital [illegible] the personal [illegible] of the shareholders and brokerage [illegible]

... Cost of Capital/Weighted Average Cost of Capital

Application

... data from illustration ... the overall cost of capital ... can be computed as

... change in calculation of Weighted Average Cost of Capital

... weighted average cost of capital may change due to following

... sources of finance

... cost of each source of finance

Weighted Average Cost of Capital (WACC) using book-value as weights

[illegible]	Amount (₹)	Proportion Weights	After-tax cost (%)	Weighted cost
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	1.0		[illegible]

Weighted Marginal Cost of Capital (WMCC)

[illegible]	Amount (₹)	Proportion Weights	After-tax cost (%)	Weighted cost
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	10	[illegible]
[illegible] capital	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]		[illegible]

[illegible] it has been observed that the raising of additional fund of ₹ [illegible] [illegible] capital [illegible] debt capital with the [illegible] specific cost of capital. Therefore, WMCC shall be [illegible]

Weighted Marginal Cost of Capital (WMCC)

Source of funds	Amount ₹	Proportion Weights	After-tax cost (%)	Weighted cost
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible] capital	[illegible]	[illegible]	10	[illegible]
[illegible] capital	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	1.00		[illegible]

WMCC = [illegible] = [illegible]%

Determination of Specific Cost of Capital

Solution

(i) Cost of debenture (K_d) issued at a premium of 10% is given by

Where

I = Fixed annual interest i.e. 12% of ₹ 10,000 or ₹ 1,200

Cost of equity share capital (K_e) is given by,

$$K_e = \frac{DPS_1}{MPS} + g$$

Where DPS_1 = Expected dividend per share at the end of current year i.e. ₹ 4.50

MPS = Market price per share i.e. ₹ 50

g = Expected growth rate of dividend i.e. 0.05

$$K_e = \frac{₹ 4.50}{₹ 50} + 0.05$$

$= 14\%$

[illegible]

Illustration [illegible]

[illegible]

Solution

[illegible]

Where [illegible]

[illegible]

k_p = [illegible]

[illegible] or [illegible]%

(ii) $k_p = \dfrac{D + \frac{RV - NP}{n}}{\frac{RV + NP}{2}}$

Where D = Annual preference dividend (Rate of dividend) i.e. ₹ [illegible]

n = No. of years in which preference shares are to be redeemed i.e. [illegible] years

RV = Amount payable at the time of redemption i.e. ₹ [illegible]

NP = Net cash proceeds at the time of issue of preference share capital i.e. ₹ [illegible]

[illegible]

[illegible] a few further statements is given [illegible] from the financial statements of ABC Ltd.

[illegible] Debentures [illegible]

[illegible] @ [illegible]%

[illegible] capital (shares of ₹ 10 each)

[illegible] Debentures

[illegible] share is ₹ [illegible] and per Debenture is ₹ [illegible]

[illegible] per share [illegible]

[illegible] cost of capital to the company for the Debenture fund and the Equity [illegible]

Solution

[illegible] of earnings per share (EPS)

[illegible] Profit after tax / [illegible] Shares

= ₹ [illegible]

[illegible] Calculation of cost of debentures after-tax (k_d)

$k_d = \frac{I}{NP}(1 - t)$

Where I = Annual interest = ₹ [illegible]

NP = Net cash proceeds from the issue of debentures i.e. [illegible] of total debenture fund

t = Corporate tax rate i.e. [illegible]%

[illegible]

$k_d = \frac{₹ [illegible]}{₹ [illegible]}(1 - 0.50)$

= [illegible] or [illegible]%

Illustration 26

Solution

Where

y = Expected growth rate

Illustration 27

Solution

Retained earnings may be computed with the help of following formula

What would be the cost of equity if β rises to 1.80?

Cost of Equity Capital using CAPM approach is given by

Where, R_f = Risk free rate of return i.e. 10% or 0.10

β = Beta coefficient i.e. [illegible]

R_m = Return on market portfolio i.e. 15% or 0.15

If β rises to 1.80,

...ation of Weighted Average Cost of Capital or Overall Cost of Capital

Cost of Specific Sources of Capital

Equity Share Capital (K_e)

Expected dividend per share with a growth rate of [illegible]

Preference Share Capital (K_p) (redeemable)

Where, D = Dividend per share i.e. ₹ 12

n = Redemption period i.e. 5 years

RV = Amount payable at the time of redemption i.e. ₹ 100.

Weighted Average Cost of Capital (K_o) using Market Value as weights

Capital	Amount (Market value) (₹)	Proportion/ Weight	After-tax cost (%)	Weighted cost
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]		[illegible]

[illegible]

Illustration 32.

Capital Structure and cost of capital of a company are given below:

Source	Book Value (₹ lakhs)	After-tax Cost of Capital (%)
Equity	[illegible]	[illegible]
Retained Earnings	[illegible]	
Debentures	[illegible]	[illegible]
Total	[illegible]	

Equity represents shares of ₹ [illegible] each. The current market value of each share is ₹ [illegible] and the [illegible] tax rate is [illegible]%

Solution

Computation of Specific Cost of Capital

(i) Cost of Equity Share Capital (K_e)

[illegible]

Weighted Average Cost of Capital

SHARE CAPITAL

COST OF RETAINED EARNINGS

OVERALL COST OF CAPITAL

WEIGHTED AVERAGE COST OF CAPITAL

Assignment

Objective Type Questions

Retained Earnings

(ii) Current market price per share ₹ 200. Corporate tax is 40%.

were as follows:

Year	Dividend per share (₹)
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]

Equity Shares (₹ 10 per share) [illegible]

All the above securities are traded in the capital market and [illegible]

Debentures (per debenture) [illegible]

Preference Shares (per share) [illegible]

Equity Shares (per share) [illegible]

Anticipated external financing opportunities are:

(i) ₹ 100 per Debenture redeemable at par: [illegible] year maturity, [illegible] coupon rate, [illegible] flotation costs, sale price ₹ [illegible]

(ii) ₹ [illegible] Preference Share redeemable at par: [illegible] year maturity, [illegible] dividend rate, [illegible] flotation costs, sale price ₹ [illegible]

[illegible] Dividends expected on the equity shares at [illegible] and the company has the practice of paying all its earnings [illegible]

[illegible] the weighted average cost of capital of the company using market weights [illegible]

Capital Structure

CONTENTS

[illegible]

7.1 Introduction

[illegible] ... and hence this decision affects the value of the firm.

It is also true that the debt-equity ratio or the leverage of a business firm influences the cost of capital and hence the value of the firm. ... [illegible] ... value of the equities of the firm. ... optimum capital structure ... is the capital structure where the overall cost of capital is minimum or the value of the firm is maximum.

7.2. Meaning of Capital Structure

Capital structure of a company generally implies different components of capital and their proportions. If we view capital from the liability side of the balance sheet of a company, it would include both equity and debt capital. While equity includes ordinary shares, preference shares and retained earnings, the debt capital comprises bonds or debentures, long-term borrowings and other long-term liabilities of the company. When the details of these sources of capital are represented by their respective quantities and proportions, we call it the capital structure of a company. According to Mr. J. Hampton, *"Capital structure is the combination of debt and equity securities that comprises a firm's financing of its assets."*

CAPITAL STRUCTURE

Capitalisation and Capital Structure

[illegible]

... capitalisation is used ... [illegible]

According to Bonneville and Dewey, "Capitalisation refers to the balance sheet values of stocks and bonds outstanding." Guthman and Dougall define ... [illegible] ... A. S. Dewing ... [illegible]

On the basis of the above definitions ... the term capitalisation ... Capital, Reserves and Surplus, Debentures and long-term borrowings ... [illegible] ... Walker and Baughn ... [illegible] ... the term capitalisation ... [illegible] ... the quantitative aspect ... the qualitative aspects ... capital of ₹ ... equity shares, preference shares and debentures ... the total capitalisation of the firm would be ₹ ... and the capital structure ... equity share capital of ₹ 25,00,000, preference share capital of ₹ ... and debentures of ₹ ... would be

7.3 Theories of Capitalisation

(ii) Earnings Theory of Capitalisation

Over-Capitalisation

[illegible]

7.4. Capital Structure and Financial Structure

[illegible]

7.5. Importance of Capital Structure

[illegible]

1. **Maximisation of return.** Proper designing [illegible]

[illegible]

Increasing the value of a company. [illegible]

Liquidity. [illegible]

Financing the long-term development plans of a firm. [illegible]

Full utilisation of the available capital. [illegible]

[illegible]

7.6 Factors Influencing the Planning of a Capital Structure

[illegible]

7.7 Guiding Principles of Capital Structure Decisions

[illegible]

(1) **The Cost Principle:** [illegible]

(2) **The Risk Principle:** [illegible]

[illegible]

Particulars	Present Capital Structure	Alternative Capital Structure		
		Equity	Preference Shares	Bonds
EBIT	[illegible]	[illegible]	[illegible]	[illegible]
Less: Interest				[illegible]
EBT	[illegible]	[illegible]	[illegible]	[illegible]
Less: Tax	[illegible]	[illegible]	[illegible]	[illegible]
EAT	[illegible]	[illegible]	[illegible]	[illegible]
Preference Dividend			[illegible]	
Earnings available to equity shareholders (Equity Earnings)	[illegible]	[illegible]	[illegible]	[illegible]
Number of Equity Shares	[illegible]	[illegible]	[illegible]	[illegible]
Earnings Per Share (EPS)	[illegible]	[illegible]	[illegible]	[illegible]
Decrease in EPS as against the earlier amount		[illegible]	[illegible]	[illegible]

This example shows that the dilution of EPS has been the most when the additional funds are raised through debt capital (i.e. through the issue of bonds). It also shows that the dilution of EPS is [illegible] when the same amount of additional fund is arranged by issuing only equity shares.

(3) **The Control Principle:** This principle suggests that while designing the capital structure of a company, the financial planners of the company should see that the control of the residual owners of the company remains undisturbed. If the additional capital requirement is financed

[illegible]

(ii) **The Flexibility Principle:** [illegible]

(iii) **The Timing Principle:** This principle suggests that the financial management of a [illegible]

7.8 Factors Determining the Capital Structure

Now we shall identify some of the factors which determine the capital structure of a company.

A. Security Characteristics

The characteristics of securities affect the capital structure of a company. This can be viewed under four broad heads.

(1) **Ownership rights:** In any new business firm the capital requirements can be fulfilled either in the following ways:

(i) Exclusively by the equity stock, or

(ii) By a combination of equity and preferred stocks, or

(iii) By the combinations of bonds, equity and preferred stocks.

The ownership rights of the new security holders would depend on the type of new security issued by the firm. The creditors or the bondholders exercise no ownership control over the firm. The preference shareholders may or may not have ownership rights depending on whether the stock is voting or non-voting. However, the equity share-holders having voting rights possess the ownership rights over the company.

If the existing shareholders are reluctant to share their ownership rights with the new lenders, the business firm then puts more emphasis on debt financing or preferred stock financing.

(2) **Repayment requirements:** The common stock or the ordinary equity shares have no repayment requirements. However debt financing involves a given contractual [illegible] obligation i.e. repayment of principal amount along with the accrued interest [illegible]

[illegible]

Internal Factors

[illegible]

The characteristics of a company: [illegible]

Stability of earnings: The capital structure of any business enterprise also depends on the stability of earnings. [illegible]

Degree of risk: The degree of riskiness [illegible] capital requirements of a company has also an important bearing upon the capital structure of that company. We have already discussed that greater [illegible]

Thus the attitude of a company towards risk-aversion gets reflected in its capital structure.

[illegible]

(12) Trading on equity: [illegible] on preference shares than the equity shareholders get a net advantage in the form of additional dividend. Thus trading on equity would imply a favourable financial leverage in the capital structure of the company.

(13) Age of a company: Younger companies which are yet to acquire goodwill and reputation, find it difficult to raise its required capital from the market. Hence, the capital structure of such companies generally includes greater proportion of equities. These companies should give more weightage to the flexibility or the manoeuvrability principle in raising the funds to meet the future growth possibilities. Whereas the established old companies having widespread reputation in the market remains at a comfortable position in raising their required funds from the sources of their choice. The capital structure of these companies are relatively more levered compared to those younger companies.

(14) Comparison with the leverage ratios of other firms in the industry: The debt-equity ratio or the leverage ratios of different firms having similar business risks, in an industry should centre around a certain standard. Hence, while designing the capital structure the financial planners of a firm should compare its leverage ratio with that standard ratio. However there may be some exceptions i.e. some firms may be more conservative or more aggressive risk takers than the average number of firms in the industry.

[illegible]

[illegible] if the investors are risk averse, the firms find it easier to raise their funds by issuing equity shares.

[illegible] Legal statutory provisions and rules: The capital structure of any company is also determined by the statutory provisions and rules prevailing in the country. The financial manager has to take into account all such legal aspects while designing the capital structure of a company. For instance, under the Income Tax laws dividend on shares [illegible] the debt capital [illegible] in the country play a crucial role in determining the capital structure [illegible] the Rules and Regulations framed by the Stock Exchange Board of India (SEBI) also affect the capital issues policy and hence the capital structure of different companies.

[illegible] Government policies: The monetary and fiscal policies of the government also affect the capital structure of a company. If the government follows a liberal [illegible] by allowing direct free entry of foreign institutional investors in the domestic capital market, it would be easier for the domestic companies to raise their required funds by issuing equity shares.

Factors determining the Capital Structure

A. [illegible] Characteristics	B. Internal Factors	C. External Factors
[illegible]	[illegible]	[illegible]

Chart [illegible]

7.5 Measurement of Capital Structure

Capital structure refers to the manner of financing the [illegible] company. [illegible] long-term [illegible] financing [illegible] Share Capital [illegible] reserves and surplus [illegible] [illegible] financing [illegible] should be a proper mix of debt and equity capital in financing the [illegible] assets [illegible] of the liabilities and equity section of the balance sheet [illegible] primarily the measures of the [illegible] of a company's capital structure. [illegible] discuss only two [illegible] ratios which are commonly used to measure the degree of [illegible] the relationship between the debt and equity components of the firm's capital structure.

(i) **Debt-Equity Ratio/Liabilities-Proprietorship Ratio**: This ratio shows how much of the [illegible] assets are financed by debt and equity and provide important information about the [illegible] for future financing. This ratio, also known as External-Internal Equity Ratio, is [illegible] measure the relative claims of outsiders and the owners against the firm's assets. It [illegible] worked out as follows:

$$\text{Debt-Equity Ratio} = \frac{\text{Long-term Debt}}{\text{Shareholders' Fund/Net Worth}}$$

[illegible]

Capital Gearing Ratio: [illegible]

Capital Gearing Ratio = [illegible]

[illegible]

(a) **Highly Geared**: A company has highly geared capital structure when the fixed interest [illegible] are proportionately large than the equity [illegible] more than [illegible]

(b) **Low Geared**: The capital structure is low geared when the equity shareholders' funds are proportionately larger than the fixed interest and/or dividend bearing securities [illegible] ratio is less than [illegible]

(c) **Evenly Geared**: It is evenly geared when these two components are more or less equal [illegible] the ratio is [illegible]

A highly geared capital structure means greater dependence of the firm on the debt and [illegible] capital [illegible]

However, a highly geared concern may provide higher return to the equity shareholders during [illegible] average rate of interest on debt and the dividend on preference shares [illegible] highly geared [illegible] to the equity shareholders [illegible] the profit left after paying a fixed rate of interest and preference dividend would [illegible] to declare a very high rate of dividend to the small proportion of equity shareholders [illegible] a favourable situation, a highly geared capital structure is able to take the full advantage of

[illegible]

7.10 Optimum Capital Structure

[illegible]

7.10.1 Features of an Optimum Capital Structure

[illegible]

[illegible]

(vi) **Conservatism in capital structure**: [illegible]

(vii) **Minimum dilution of control**: [illegible]

(viii) **Flexibility of the firm**: [illegible]

(ix) **Maximizing the capacity of debt repayment**: [illegible]

[illegible]

Features of Optimum Capital Structure

- Minimization of the cost of capital
- Maintenance of proper debt-equity ratio
- Maximization of the value of a firm
- Maximization of the market price of equity shares
- Maximum possible use of financial leverage
- Greater advantage of the leverage
- Avoidance of higher financial risks

- Maintenance of solvency and liquidity
- Maintenance of financial stability
- Flexibility of the capital structure
- Conservatism in capital structure
- Minimum dilution of control
- Profitability of the firm
- Maximizing the capacity of debt repayment

Capital Structure Theories

[illegible] and the value of a firm. These are:

1. Net Income (NI) Approach,
2. Net Operating Income (NOI) Approach,
3. Modigliani Miller (MM) Approach and
4. Traditional Approach.

Assumptions

[illegible]

1. [illegible]
2. [illegible]
3. [illegible] earnings [illegible]
4. The total assets of the firm are given and they remain unchanged. [illegible]
5. [illegible]
6. The operating earnings [illegible]
7. The business risk of a firm is also assumed to remain constant and it remains independent of the capital structure and financial risk.
8. All the investors have similar expectations regarding the future [illegible] EBIT for a given firm.
9. The business firm is supposed to have a perpetual life.

11.11.1. Net Income (NI) Approach

According to the Net Income Approach, as suggested by David Durand, the capital structure [illegible] bearing upon the valuation of the firm. [illegible] change in the capital structure results in a corresponding change in the overall cost of capital as well as the value of the firm. Thus the firm can influence its value by changing the proportion of [illegible] in the capital structure.

According to this approach, higher financial leverage or the higher debt content in the capital structure [illegible] the weighted average cost of capital of the firm. As a result, the value of the firm [illegible] the value of the firm. Following the similar argument, we can say that a fall in the financial leverage [illegible] an increase in the overall cost of capital and hence it ultimately leads to a fall in the value of the firm.

This approach is based on the following assumptions:

(i) There are no corporate taxes [illegible]

(ii) The cost of debt capital is less than the cost of equity capital [illegible]

(iii) Any change in the financial leverage [illegible] does not change the risk perception of the investors and

(iv) The cost of debt capital and the cost of equity capital will remain unchanged irrespective of the change in the debt-equity mix of the firm.

The value of the firm, on the basis of this approach, can be ascertained as follows:

$$V = E + D$$

where V = Value of the firm

E = Market Value of the Equity

D = Market Value of the Debt

Again, the market value of the equity capital can be expressed as follows:

$$E = \frac{E_A}{k_e}$$

where E_A = Earnings available for equity shareholders or Equity Earnings

k_e = Cost of equity capital or the equity capitalisation rate

Here $k_e = \frac{DPS_1}{MPS} + g$

where DPS_1 = Expected Dividend at the end of the first year

MPS = Current market price of the equity share and

g = Expected growth rate of dividend payments

Since we have assumed that a firm pays 100% of its earnings as dividends, [illegible] earnings will be zero.

In our case, $g = br$ where b = retention rate,

and r = rate of return on equity shares

But, on the basis of our previous assumption, $b = 0$ and therefore, $g = 0$

$$k_e = \frac{DPS_1}{MPS}$$

In operational terms, we can say that $DPS_1 = EPS_1$

where EPS_1 = Earning Per Share (EPS) at the end of the first year

$$k_e = \frac{EPS_1}{MPS}$$

If N = Number of outstanding equity shares, then

we can write $k_e = \frac{EPS_1 \cdot N}{MPS \cdot N} = \frac{E_A}{E}$

$$= \frac{\text{Earnings available to the equity shareholders or Equity Earnings}}{\text{Total market value of equity shares}}$$

[illegible]

where $EBIT$ = Earnings before Interest and Tax [illegible] and

Total interest payments

The market value of debt capital (D) can be ascertained as follows:

$D = \frac{I}{k_d}$ where k_d = the cost of debt capital and

I = total interest payments

[illegible]

The overall cost of capital (k_o) can also be ascertained as the weighted average of the costs of debt and equity capital

$$k_o = W_d k_d + W_e k_e$$

where W_d = Proportion of market value of debt capital to the total value of the firm

i.e. the relative weight of the debt capital and

W_e = Proportion of market value of equity capital to the total value of the firm

i.e. the relative weight of the equity capital

[illegible]

Total value of the firm $(V) = \frac{EBIT}{k_o}$

Illustration 1.

P Ltd. has operating income of ₹ [illegible] and its cost of equity is [illegible]% and cost of debt is [illegible]%. The amount of debt capital is ₹ 5,00,000.

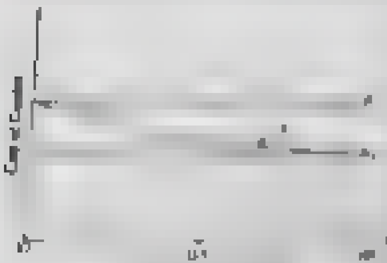
(a) What is the value of the firm? Find out the overall cost of capital (k_o).

(b) What is the value of the firm and corresponding overall cost of capital if the amount of debt capital increases to ₹ [illegible]

On the other hand, if the firm uses no debt, ... [illegible]

If the financial leverage ... [illegible]

These relationships have been indicated in Fig. ... [illegible] degree of leverage along the horizontal axis and the cost of capital ... [illegible]



Degree of Leverage (D/V)

Fig.

[illegible] independent of the degree of leverage.

[illegible] debt capital and no equity capital then the overall cost of capital would be minimum and the value of the firm would become maximum.

Criticisms of Net Income Approach

The principal drawback of the Net Income approach is that it ... [illegible] capital and the cost of equity capital ... [illegible] debt capital, the cost of equity tends to rise ... [illegible] capital also starts rising. Moreover, the general assumption of the ... [illegible] a firm as dividend ... [illegible] feasibility.

7.11.2. Net Operating Income (NOI) Approach

The Net Operating Income (NOI) approach towards the designing of capital structure was suggested by Durand. But this approach is diametrically opposite to the NI approach which we have already discussed. According to this approach, the value of a firm is not at all affected by the changes in its capital structure. This theory indicates that the market price of shares and the overall cost of capital would be independent of the degree of financial leverage of a firm. Hence, the theory suggests that the capital structure decisions in any firm are irrelevant and hence, there will be no such thing as optimum capital structure. Any capital structure can be considered as an optimum capital structure for a firm.

This theory is based on the following assumptions:

(1) The overall cost of capital 'K_o' remains constant for all degrees of financial leverage.

[illegible]

Again, the cost of equity capital can be calculated as follows:

[illegible]

[illegible]

Again, we know that $V = D + S$

[illegible]

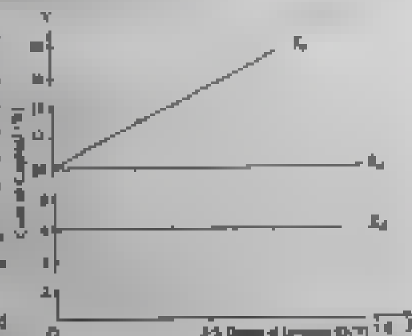


Fig. 2

[illegible]

Criticisms of Net Operating Income Approach

This theory has also been criticised on the following grounds:

(a) [illegible]

(b) [illegible]

[illegible]

Difference between Net Income (NI) Approach and Net Operating Income (NOI) Approach

Following are the important points of difference between NI Approach and NOI Approach:

Point of difference	Net Income (NI) Approach	Net Operating Income (NOI) Approach
1. Value of the firm	1. [illegible] of the firm [illegible] capital structure. It means [illegible] the debt [illegible] the overall capital structure.	1. [illegible] value of the firm.
2. Computation of value of the firm	2. The value of the firm in the form of NI approach can be computed as follows: [illegible] Where [illegible] = Value of the firm, [illegible] = Market value of the Equity, [illegible] = Market value of the debt	2. [illegible] NOI Approach [illegible] the firm [illegible] determined as follows: $V = \frac{EBIT}{K_o}$ Where EBIT = Earnings before Interest and Tax, K_o = Overall Cost of capital
3. Cost of Equity capital (K_e)	3. Under this approach cost of equity capital K_e is assumed to be [illegible] and it does not depend on the debt equity mix of the firm. Hence, the cost of equity capital curve is parallel to the horizontal axis.	3. Under this approach cost of equity capital (K_e) [illegible] increases [illegible] degree of financial [illegible]. Hence, the cost of equity [illegible] curve becomes [illegible]

Point of difference	Net Income (NI) Approach	Net Operating Income (NOI) Approach
[illegible]	[illegible]	[illegible]
4. [illegible]	4. [illegible]	4. [illegible]
5. [illegible]	5. [illegible]	5. [illegible]

Traditional Approach

[illegible]

[illegible] approach suggests that [illegible] the value of the firm can be maximised. [illegible] this approach.

[illegible]

Degree of leverage

Figure

The support of the traditional approach suggests that [illegible] debt [illegible] capital. However, after a certain stage the cost of capital tends to rise with an increase in the amount of [illegible]. This is due to the fact that the risk [illegible] with an increase in the debt equity ratio or leverage in the capital structure of the firm. As a result, the equity [illegible] on their investment [illegible] increase in the use of debt [illegible] still further [illegible]

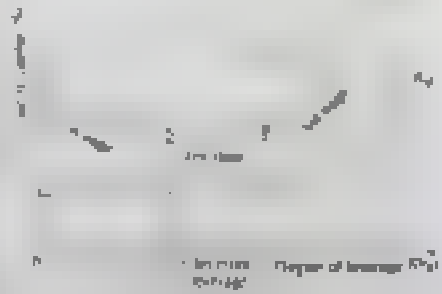


Fig. 4

■ Criticisms of the Traditional Approach

debt-equity planning can simply change the way in which the profit and risk attached to it are distributed ... different values of these profitability and total risks are different.

Illustration 3.

Equity Capitalisation Rate/Cost of Equity (k_e)

(b) with 40% Debt and 60% Equity 16%

(c) with 60% Debt and 40% Equity

Determine the market value of the firm ... under Traditional Approach.

Computation of Value of the firm (V) and Overall Cost of Capital (k_o) under Traditional Approach

Particulars	0% Debt	40% Debt	60% Debt

Overall Cost of Capital (k_o = ...)

4. The Modigliani-Miller Hypothesis

Modigliani and Miller ... market value.

[illegible]

(b) After entering additional data [illegible]

[illegible]

[illegible]

However, the [illegible] leverage. The [illegible]

[illegible]

(c) However, [illegible]

[illegible]

Where V_L = Value of the geared firm

V_U = Value of the ungeared firm

t = Corporate tax rate

D = Amount of debt in levered firm

Illustration 6

[illegible]

Using M-M Model with corporate taxes:

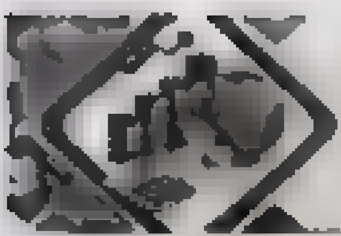
(a) Determine the total Market Value of both the firms.

(b) Determine the Cost of Equity (K_e) for both the firms.

(c) Determine the Overall Cost of Capital (K_o) for the firms.

(d) Make suitable comment on the above computations.

[illegible]



DIVIDEND POLICY

CONTENTS

$$DPS_t = pEPS_t$$

Dividend Policy

Objectives of Dividend Policy

(ii) Provision of sufficient funds for the future growth of the company.

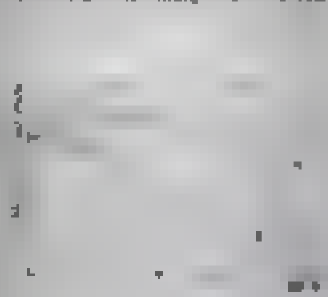


Fig. 4

Formulating a Dividend Policy

[illegible]

Illustration 3

Solution

According to Walter's model, market price of a share, P is given by,

where,

Solution

where,

P = Market value of an equity share

D = Dividend per share

$= \frac{\text{Dividend paid}}{\text{Number of shares outstanding}}$

r = Rate of return on investment

K_e = Capitalisation rate

Illustration 4

Following information relating to [illegible] are given:

Profit after tax	[illegible]
Dividend payout ratio	[illegible]
Number of equity shares	[illegible]
Cost of Equity	[illegible]
Rate of Return on investment	[illegible]

(i) What would be the market value per share as per Walter's model?

(ii) What is the optimum dividend payout ratio according to Walter's model and market value of equity share at that payout ratio?

Illustration 5

[illegible]

Net Profit	[illegible]
Outstanding [illegible] Preference Shares	[illegible]
No. of Equity Shares	[illegible]
Return on Investment	[illegible]
Cost of Capital [illegible]	[illegible]

Solution

Calculation of Dividend Payout (D/P) Ratio

D/P Ratio = [illegible]

[illegible]

Illustration 6

The following information is available in respect of a firm:

Capitalisation rate (K_e) = 0.10

Earnings per share (E) = ₹10

Assumed rate of return on investments (r): (i) 15%, (ii) [illegible] and (iii) [illegible].

Show the effect of dividend policy on the market price of shares, using Walter's model. Assume Dividend Pay-out ratio (D/P Ratio): 0%, 25%, 50%, 75% and 100%.

Also, state the optimum dividend pay-out ratio.

Solution

According to Walter's Model, market price of a share, P is given by:

[illegible]

Interpretation

[illegible]

So, the optimum pay-out ratio is zero.

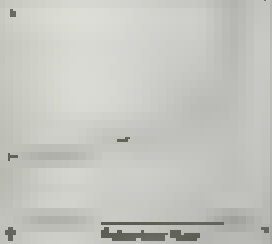


Fig. 4

Illustration 9

[illegible]

Solution

[illegible] Model, the Market Price of a share [illegible]

where P = Market price of a share

[illegible] per share

[illegible]

k = Retention ratio or percentage of earnings retained [illegible]

[illegible]

[illegible] = Rate of return on investment [illegible]

Putting the values in the model, we get

[illegible]

Market price of a share P = ₹ [illegible]

Note: Value of the firm

[illegible]

where n = Number of shares

and P = Market price of a share.

[illegible]

Illustration 10

The following information is available in respect of the rate of return on investment [illegible] the capitalisation rate [illegible] and earnings per share [illegible] of ABC Ltd.

[illegible]

[illegible]

[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]

Solution

Using Gordon's Model, the value of a share [illegible]

[illegible]

where P = Value of a share

E = Earnings per share

b = Retention ratio

[illegible]

k_e = Capitalisation rate

r = Rate of return on investment

The values of shares of ABC Ltd. for different 'r' values and retention ratios are shown in the following table

[illegible]	[illegible]	Retention Ratio	[illegible]	Value of Share
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

[illegible]

Illustration 11

[illegible]

Solution

According to the Modigliani-Miller model, price of the company's share at the end of the year P_1 can be calculated from the following formula

$$P_0 = \frac{D_1 + P_1}{1 + k_e}$$

where, P_0 = Current market price per share

= ₹ 10,

D_1 = Dividend per share at the year end

P_1 = Market price per share at the year end

and k_e = Capitalisation rate

= 15% = 0.15

[illegible]

Hence number of equity shares to be issued at the year end n_1 when dividend is paid

[illegible]

= 31,325 shares

Illustration 12

[illegible] Company has a cost of equity capital of 10%, the market value of the firm [illegible] 20% the market value [illegible] Show that under the M-M assumptions, the payment of dividend does not affect the value of the firm.

Solution

To prove the irrelevance of dividend payment on the value of the firm, we have to calculate the value of the firm when dividend is paid and also the value of the firm when dividend is not paid.

Calculation of the value of the firm when dividends are paid

Criticisms of M-M Hypothesis

Summary

Assignment

[illegible]

TABLE (Contd.)

TABLE (Contd.)

TABLE 2

The Compound Value of an Annuity of One Rupee

TABLE - 3 (Contd.)

TABLE - 3 (Contd.)

TABLE - 4

The Present Value of an Annuity of One Rupee

TABLE - 4 (Contd.)

Year	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
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TABLE - 4 (Contd.)

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Question Paper

[illegible]

[illegible]

Paper : [illegible]

(Financial Economics)

Full Marks : [illegible]

The figures in the margin indicate full marks

Candidates are required to give their answers in their own words as far as practicable

Group : A

1. Answer any ten questions :

(a) A person keeps ₹ [illegible] in each of investment options I_1 and I_2 for [illegible] years. I_1 provides [illegible]% simple interest rate per annum where as I_2 provides [illegible]% interest rate compounded yearly. What will be the maturity values of these two investments ? 2

(b) Suppose you got ₹ [illegible] on maturity of a deposit of ₹ [illegible] for one year. If the inflation rate for that year was [illegible]%, what was the rate of interest that you got actually on your deposit ? 2

(c) Differentiate between bid price and ask price of a bond. 2

(d) What is yield curve ? 2

(e) Determine the present value of a perpetuity that pays ₹ [illegible] per year with [illegible]% interest rate. 2

(f) How could a risk-averse individual minimise risk of portfolio return when there are a mutual funds that are (i) uncorrelated, (ii) positively correlated ? 1+1

(g) If the spot rates for 1 and 2 years are s_1 = [illegible]% and s_2 = [illegible]%, what is the forward rate $f_{1,2}$? 2

(h) If the premium on a call option has declined recently, does the decline indicate that the option is a better buy than it was previously ? 2

(i) State the one-fund theorem. 2

(j) What is the difference between simple and compound interest ? 2

(k) What is a commercial paper ? 2

(l) What is amortization ? 2

(m) Define price-yield curve. 2

(n) State Forward price formula. 2

(o) Define Debt Equity Ratio. 2

Group : B

2. Answer any three questions :

(a) (i) Consider the following information for two assets :

Asset	r	σ	
A	12%	20%	σ_{AB} = [illegible]
B	15%	[illegible]	

A portfolio is formed with weights w_A = [illegible] and w_B = [illegible].

Calculate the mean and variance of the portfolio.

(ii) Show the feasible set of two assets in a diagram. (1 + 2) + 2

(b) Discuss the factors that affect stock option prices. 5

(c) Explain the dividend payment process of corporation. 5

(d) State and prove the portfolio diagram lemma. 5

(e) Two stocks are believed to satisfy the two-factor model

$$r_1 = a_1 + 2f_1 + f_2$$

$$r_2 = a_2 + 3f_1 + 4f_2$$

In addition, there is a risk-free asset with a rate of return of 10%. It is known that $\bar{r}_1 = 15\%$ and $\bar{r}_2 = 20\%$. What are the values of λ_0, λ_1 and λ_2 for this model ? 5

Group - C

Answer any three questions.

3. Assume that the expected rate of return on the market portfolio is 23% and the risk-free return is 7%. The standard deviation of the market is 32%. Assuming that the market portfolio is efficient.
   (a) Derive the equation of the capital market line. Interpret the slope of the line.
   (b) What will be the standard deviation of this position if an expected return of 39% is desired?
   (c) If you invest ₹ 600 in the risk-free asset and ₹ 1,400 in the market portfolio, how much money should you expect to have at the end of the year ?
   (d) Consider an asset with expected pay-off ₹ 1,000 and covariance of 0.154 with the market. Determine the current value of the asset. (2+2)+1+2+3
4. What is futures? How could you create a synthetic futures contract with purchase of a European call option and sale of a European put option, having same exercise price and same expiration date ? 2+8
5. 'The CAPM is derived directly from the condition that the market portfolio is a point on the edge of the feasible region that is tangent to the capital market line.'— Discuss the statement. 10
6. Explain three standard explanations (or theories) for the Term Structure. 10
7. Show that points on the efficient frontier can be characterised by an optimisation problem, formulated by Markowitz. 10